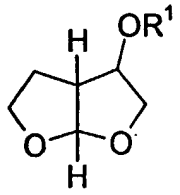
## Claims

1. A process for the preparation of compounds of formula (I)

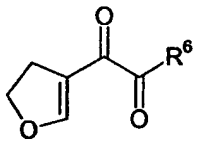


(I)

diastereoisomers, enantiomers, and mixtures thereof,

wherein $R^1$ is hydrogen, comprising:

a) treating a compound of formula (XII)



(XII)

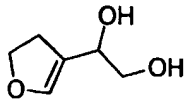
wherein:

$R^6$ is halogen, $-OR^7$, or $-NR^8R^9$;

$R^7$ is hydrogen, $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, or $C_{6-14}$aryl$C_{1-6}$alkyl;

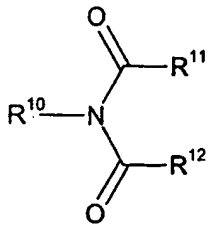
$R^8$ and $R^9$ are independently selected from hydrogen, $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, and $C_{6-14}$aryl$C_{1-6}$alkyl;

with a first reducing agent to form an alcohol of formula (III)



(III)

b) treating the alcohol with bromine, iodine, iodine monochloride, an N-fluoro bis sulfonamide or a compound of formula (XIII)



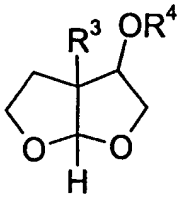
(XIII)

wherein:

$R^{10}$ is chlorine, bromine, or iodine; and

$R^{11}$ and $R^{12}$ are independently selected from $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, and $C_{6-14}$aryl$C_{1-6}$alkyl, or $R^{11}$ and $R^{12}$ together with the atoms to which they are attached form a 5-8 membered ring;

to form a compound of formula (II)



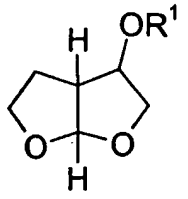
(II)

wherein $R^3$ is halogen, and $R^4$ is hydrogen; and

c) treating a compound of formula (II) with a second reducing agent to afford a compound of formula (I), wherein $R^1$ is hydrogen.

2. A process for the preparation of compounds of formula (I) according to claim 1, wherein said first reducing agent is selected from the group consisting of di-*iso*butylaluminum hydride (DIBAL), sodium borohydride, and lithium aluminum hydride, $R^6$ in the compound of formula (XII) is $-OR^7$ wherein $R^7$ is $C_{1-6}$alkyl, the compound of formula (XIII) is N-bromosuccinimide, and the second reducing agent is palladium on carbon in combination with hydrogen.

3. A process for the preparation of compounds of formula (I)

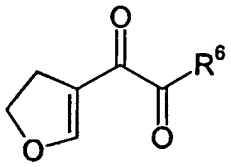


(I)

diastereoisomers, enantiomers, and mixtures thereof,

wherein $R^1$ is $-C(O)R^2$; and $R^2$ is $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, or $C_{6-14}$aryl$C_{1-6}$alkyl, comprising:

a) treating a compound of formula (XII)



(XII)

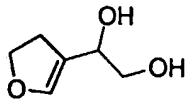
wherein:

$R^6$ is halogen, $-OR^7$, or $-NR^8R^9$;

$R^7$ is hydrogen, $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, or $C_{6-14}$aryl$C_{1-6}$alkyl; and

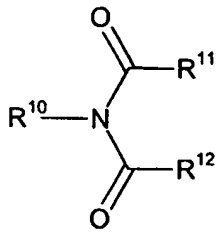
$R^8$ and $R^9$ are independently selected from hydrogen, $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, and $C_{6-14}$aryl$C_{1-6}$alkyl;

with a first reducing agent to form an alcohol of formula (III)



(III)

b) treating the alcohol with bromine, iodine, iodine monochloride, an N-fluoro bis sulfonamide or a compound of formula (XIII)



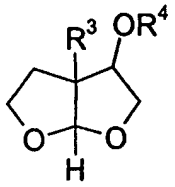
(XIII)

wherein:

$R^{10}$ is chlorine, bromine, or iodine; and

$R^{11}$ and $R^{12}$ are independently selected from $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, and $C_{6-14}$aryl$C_{1-6}$alkyl, or $R^{11}$ and $R^{12}$ together with the atoms to which they are attached form a 5-8 membered ring;

to form a compound of formula (II)



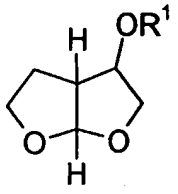
(II)

wherein $R^3$ is halogen, and $R^4$ is hydrogen;

c) treating a compound of formula (II) with a second reducing agent to afford a compound of formula (I), wherein $R^1$ is hydrogen; and

d) resolving to form a compound of formula (I), wherein $R^1$ is $-C(O)R^2$ and $R^2$ is $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, or $C_{6-14}$aryl$C_{1-6}$alkyl.

4. A process for the preparation of compounds of formula (I)

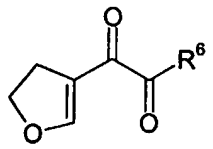


(I)

diastereoisomers, enantiomers, and mixtures thereof,

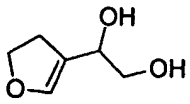
wherein $R^1$ is hydrogen or $-C(O)R^2$ wherein $R^2$ is $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, or $C_{6-14}$aryl$C_{1-6}$alkyl,

comprising reducing a compound of formula (XII)



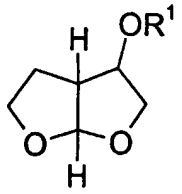
(XII)

to afford an alcohol of formula III



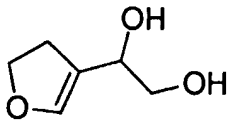
(III).

5. A process for the preparation of compounds of formula (I)



wherein $R^1$ is hydrogen,

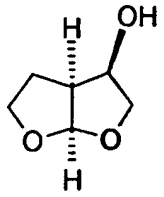
comprising treating a compound of formula (III)



(III)

with an acid selected from the group consisting of hydrochloric acid, hydrobromic acid, hydroiodic acid, acetic acid, sulfuric acid, and sulfonic acid.

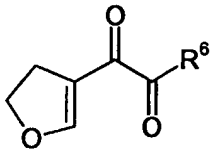
6. A process for the preparation of a compound of formula (V)



(V)

substantially free from other diastereoisomers, comprising:

a) treating a compound of formula (XII)



(XII)

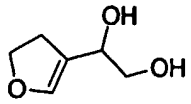
wherein:

$R^6$ is halogen, $-OR^7$, or $-NR^8R^9$;

$R^7$ is hydrogen, $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, or $C_{6-14}$aryl$C_{1-6}$alkyl; and

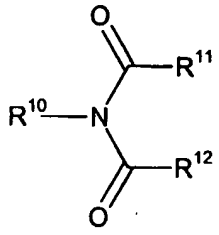
$R^8$ and $R^9$ are independently selected from hydrogen, $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, and $C_{6-14}$aryl$C_{1-6}$alkyl;

with a first reducing agent to form an alcohol of formula (III)



(III)

b) treating the alcohol with bromine, iodine, iodine monochloride, an N-fluoro bis sulfonamide or a compound of formula (XIII)



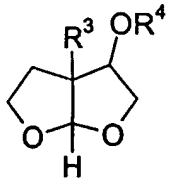
(XIII)

wherein:

$R^{10}$ is chlorine, bromine, or iodine; and

$R^{11}$ and $R^{12}$ are independently selected from $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, and $C_{6-14}$aryl$C_{1-6}$alkyl, or $R^{11}$ and $R^{12}$ together with the atoms to which they are attached form a 5-8 membered ring;

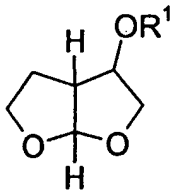
to form a compound of formula (II)



(II)

wherein $R^3$ is halogen and $R^4$ is hydrogen;

c) treating a compound of formula (II) with a second reducing agent to afford a compound of formula (I)

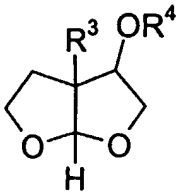


(I)

wherein $R^1$ is hydrogen; and

d) resolving to form a compound of formula (I), wherein $R^1$ is hydrogen or $-C(O)R^2$ and $R^2$ is $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, or $C_{6-14}$aryl$C_{1-6}$alkyl.

7. A compound of formula (II)



(II)

wherein:

$R^3$ is halogen;

$R^4$ is hydrogen or $-C(O)R^5$;

$R^5$ is hydrogen, $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, or $C_{6-14}$aryl$C_{1-6}$alkyl; and

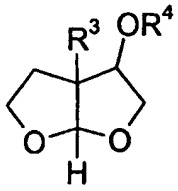
diastereoisomers, enantiomers, and mixtures thereof.

8. A compound of formula (II) according to claim 7 wherein $R^3$ is bromine and $R^4$ is hydrogen.

9. A compound of formula (II) according to claim 7 wherein $R^3$ is bromine, $R^4$ is $-C(O)R^5$ and $R^5$ is $C_{1-6}$alkyl,

10. A compound of formula (II) according to claim 7 wherein $R^3$ is bromine, $R^4$ is $-C(O)R^5$, and $R^5$ is $-CH_3$.

11. A process for the preparation of compounds of formula (II)




(II)

wherein:

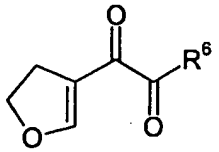
$R^3$ is halogen;

$R^4$ is hydrogen or $-C(O)R^5$;

$R^5$ is hydrogen, $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, or $C_{6-14}$aryl$C_{1-6}$alkyl; and

diastereoisomers, enantiomers, and mixtures thereof, comprising:

a) treating a compound of formula (XII)




(XII)

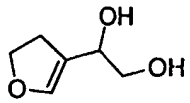
wherein:

$R^6$ is halogen, -$OR^7$, or –$NR^8R^9$;

$R^7$ is hydrogen, $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, or $C_{6-14}$aryl$C_{1-6}$alkyl; and

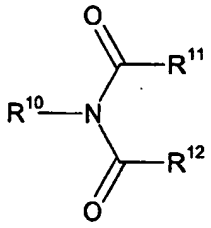
$R^8$ and $R^9$ are independently selected from hydrogen, $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, and $C_{6-14}$aryl$C_{1-6}$alkyl;

with a reducing agent to form an alcohol of formula (III)




(III)

b) treating said alcohol with bromine, iodine, iodine monochloride, an N-fluoro bis sulfonamide or a compound of formula (XIII)




(XIII)

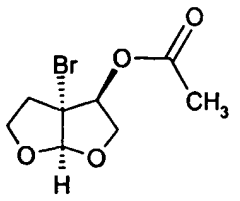
wherein:

$R^{10}$ is chlorine, bromine, or iodine; and

$R^{11}$ and $R^{12}$ are independently selected from $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, and $C_{6-14}$aryl$C_{1-6}$alkyl, or $R^{11}$ and $R^{12}$ together with the atoms to which they are attached form a 5-8 membered ring; to form a compound of formula (II), wherein $R^3$ is halogen and $R^4$ is hydrogen; and

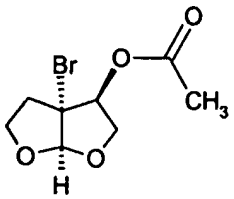
c) resolving to yield a compound of formula (II) wherein $R^3$ is halogen; $R^4$ is hydrogen or –C(O)$R^5$; and $R^5$ is hydrogen, $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, or $C_{6-14}$aryl$C_{1-6}$alkyl.

12. A compound of formula (XIX)



(XIX)

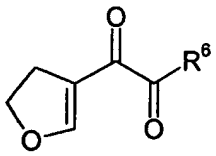
13. A process for the preparation of a compound of formula (XIX)



(XIX)

comprising:

a) treating a compound of formula (XII)



(XII)

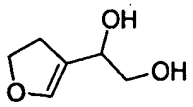
wherein:

$R^6$ is halogen, $-OR^7$, or $-NR^8R^9$;

$R^7$ is hydrogen, $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, or $C_{6-14}$aryl$C_{1-6}$alkyl; and

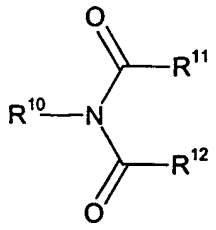
$R^8$ and $R^9$ are independently selected from hydrogen, $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, and $C_{6-14}$aryl$C_{1-6}$alkyl;

with a reducing agent to form an alcohol of formula (III)



(III)

b) treating said alcohol with bromine, iodine, iodine monochloride, an N-fluoro bis sulfonamide or a compound of formula (XIII)



(XIII)

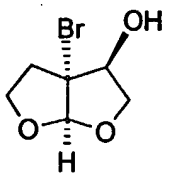
wherein:

$R^{10}$ is chlorine, bromine, or iodine; and

$R^{11}$ and $R^{12}$ are independently selected from $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, and $C_{6-14}$aryl$C_{1-6}$alkyl, or $R^{11}$ and $R^{12}$ together with the atoms to which they are attached form a 5-8 membered ring; and

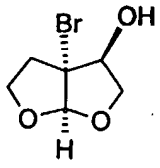
c) optionally resolving to yield a compound of formula (XIX).

14. A compound of formula (XX)



(XX) .

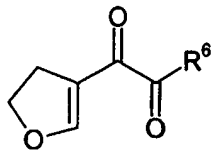
15. A process for the preparation of a compound of formula (XX)



(XX)

comprising:

a) treating a compound of formula (XII)



(XII)

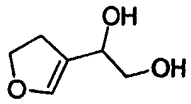
wherein:

$R^6$ is halogen, $-OR^7$, or $-NR^8R^9$;

$R^7$ is hydrogen, $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, or $C_{6-14}$aryl$C_{1-6}$alkyl; and

$R^8$ and $R^9$ are independently selected from hydrogen, $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, and $C_{6-14}$aryl$C_{1-6}$alkyl;

with a reducing agent to form an alcohol of formula (III)

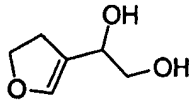


(III)

b) treating said alcohol with N-bromosuccinimide to form a compound of formula (XX); and

c) optionally resolving to yield diastereoisomers of compounds of formula (XX).

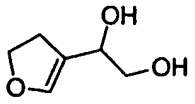
16. A compound of formula (III)



(III).

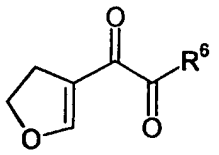
17. 1-(4,5-dihydrofuran-3-yl)ethane-1,2-diol.

18. A process for the preparation of compound (III)



(III)

comprising treating a compound of formula (XII)



(XII)

wherein $R^6$ is halogen, $-OR^7$, or $-NR^8R^9$; where $R^7$ is hydrogen, $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, or $C_{6-14}$aryl$C_{1-6}$alkyl; and $R^8$ and $R^9$ are independently selected from hydrogen, $C_{1-6}$alkyl, $C_{3-8}$cycloalkyl, $C_{6-14}$aryl, and $C_{6-14}$aryl$C_{1-6}$alkyl; with a reducing agent.

19. A process according to claim 18 wherein the reducing agent is selected from the group consisting of di-*iso*butylaluminium hydride (DIBAL), sodium borohydride, and lithium aluminum hydride.

20. A process for the preparation of compounds of formula I, II, V, XIV, XIX, and XX, according to any of claims 1, 3, 4, 6, 11, 13, or 15 wherein the first reducing agent is selected from the group consisting of di-*iso*butylaluminium hydride (DIBAL), sodium borohydride, and lithium aluminum hydride, wherein $R^6$ in the compound of formula (XII) is $-OR^7$ where $R^7$ is $C_{1-6}$alkyl, wherein the compound of formula (XIII) is N-bromosuccinimide, and the second reducing agent is palladium on carbon in combination with hydrogen.

21. A process according to any of claims 1, 2, 3, or 4 further comprising the step of resolving to obtain single enantiomers.